

Edward F. Roseman

Oral History Interview
Interview Number 1

Interviewed by Carson G. Prichard
Observed by Brittany B. Fremion
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WebEx video conference

Project—Human dimensions of the Lake Huron salmon fishery crash: Using oral histories to assess the attitudes, values, and beliefs of anglers and non-angler stakeholders in Great Lakes coastal communities

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PRICHARD: So I'm here with Dr. Ed Roseman, a fisheries research biologist with the USGS [United States Geological Survey] Great Lakes Science Center, and also Dr. Brittany Fremion, a professor in the Department of History at Central Michigan University. I'm Carson Prichard, a researcher with Central Michigan University, doing an oral history project describing—interviewing participants in the crash and collapse of Lake Huron alewife and salmon fisheries in the mid-2000s.

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PRICHARD: So to begin Ed, could you describe your professional role in research and decision making regarding the Lake Huron salmon fishery during the collapse?

ROSEMAN: Sure. I was hired to be a research fish biologist at the US Geological Survey's Great Lakes Science Center working on Lake Huron. I started in November of 2004. And [the] 2004 survey was the first year that showed pretty much the complete collapse of the alewife population. And alewife are the main prey for Chinook salmon

and a lot of other predators in Lake Huron. So I essentially came on the scene as a research scientist right after the collapse of the prey base, and have been working on Lake Huron—mostly the fish community at the prey level—for the last, what is that, seventeen years now? Yeah, since o-four. And my role is to help carry out the survey on the lake using the bottom trawl equipment, and analyzing and reporting out the information that we gather in those surveys. We've done a lot of other related projects over the years related to the collapse and we'll probably talk more about those a little further into the interview, I think.

I guess I should say my role also involves serving on the Great Lake[s] Fishery Commission's Lake Huron Technical Committee. For several years I was an active committee member and I've since stepped down from that role and I'm more of a resource scientist for the committee now. We have some new biologists on staff that we've rotated into the role of serving as the committee member. And I kind of assume you've talked to somebody from the fish commission, or have that built into the study somewhere, but they're kind of the nexus for coordinating data and information and communication about all the Great Lakes status and trends over time. And it—the fish commission's made up of scientists from all the state, federal, provincial, tribal, and some NGO [nongovernmental organization] groups that meet on a routine basis to share information.

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PRICHARD: So were you a biologist on board for the 2004 survey then?

ROSEMAN: No, I got hired right after the survey completed and I think November first was my first day. Those surveys on Lake Huron take place in October. So they're, you know, kind of the end of the year survey for the prey fish. And for a few years our agency did do some spring surveys typically in May. We conducted one in—I want to say 2005—more as a training exercise for the new staff—there were several of us that were new hires at that time. But also to kind of confirm or validate what we were seeing with the collapse of alewife was real, you know? That it wasn't just something that we saw in the fall and because of the distribution or something to do with their biology and behavior. But we did that spring survey and we caught very few if any alewife at all. So it was kind of a training exercise for new staff, but also validated what we were seeing in terms of the collapse of the prey base was real. And I've been on the fall survey every year since then.

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PRICHARD: Going into the 2005 fall survey, what were kind of your feelings having gone through all of 2005, sitting on the 2004 survey? And I guess also we should talk about the 2003 survey which showed like the big decline in adult alewives, but also a big spike in age-zero alewives. So, I guess, can you describe how the feelings and your thoughts—and maybe other peoples' feelings and thoughts—changed when you go from the 2003 to the 2004, and then to the 2005 survey?

ROSEMAN: Yeah, I've been thinking about that since we talked a few weeks ago. And I think the—there are several things that were kind of like more feeling. One was just the absolute awe and respect of nature that something so huge, at such a large ecosystem

level, could happen so rapidly in one of the Great Lakes. And there were some signs that this was coming. But for the alewife to basically be extirpated from Lake Huron was unthought-of. Even though it was something that we as fishery managers have strived to do for decades because they are an invasive species—they were out of control in abundance, they were a nuisance. And they are—part of the reason that the non-native salmonids like the Chinook were put in the Great Lakes in the first place was to control the alewives. So that was—one feeling I had was just a sense of disbelief or awe that something that big could happen so quickly and so ubiquitously across the whole basin of the lake, was pretty remarkable in my perspective.

And that—I've studied recruitment of fishes for pretty much my whole career—thirty-plus years—and the fact that we have a very large young-of-the-year hatch in one year and that they didn't make it through the next year was no big surprise to me. I mean there are many factors that Carson I'm sure you're well aware of—environmental and biological—that influence survival of fish through time. So that wasn't a big surprise. But for it to be ubiquitous across the lake and so widespread and quick was kind of amazing, but not a total surprise.

There were signs in the fishery that something was going on with the balance between predators and prey. For—from what I understand—for a little while before that with the condition factor of some of the predators like the Chinook salmon, their weight to length ratio was kind of declining, suggesting that there was something out of balance with the predator-prey dynamics in the lake. But for a complete collapse of the alewife prey base to happen was quite surprising and unprecedented—.

There was more to your question. I'm trying to think what it was (both laugh). But I think it was about the lack of survival of the alewife population. And what's even been more impressive, from a biologist perspective to me, is how the alewife have just stayed low for over a decade now, with a little bit of spotty recruitment happening. We've seen a few age-zero fish here and there in our surveys but they really haven't bounced back to any numbers like they were in the eighties or nineties—1980s or nineties.

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PRICHARD: Okay. I guess a little bit more to what I was asking is I wondered if you felt hope with respect to either the alewife collapse or with respect to the possibility of them recovering, or maybe something like worry, or dread, with respect to having to interact with stakeholders and relay the information that the bottom trawl survey was giving you, and considering all of the stakeholders and their investment—or certain stakeholders' investment in recreational Chinook salmon fishing.

ROSEMAN: Yeah, so there's a multitude of things that I kind of made some notes. One thing I was happy to see was the rebound of native species like lake trout and walleye in the absence of alewife. There have been studies that have shown the negative interactions between alewife and lake trout with the thiamine-thiaminase issue. And the alewife would eat walleye fry and prevent year-class—strong year-classes. So in the absence of alewife we saw walleye explode in Saginaw Bay and elsewhere in the lake. And also the resurgence of native reproduction of lake trout in the lake. In my feeling, that's a good thing. And there were other fishes, like emerald shiner rebounded for a couple years and we documented that in some of our surveys.

So those—those are kind of the, I guess, success pieces in my mind that came out of the collapse of alewife. The big concern—and this was expressed by all the science agencies and staff, as well as our stakeholders—was, What’s going to happen now that we have a very limited prey portfolio in the lake for the existing predators to feed on? There was widespread concern. We had several meetings that the fish commission and Michigan Sea Grant and the Michigan DNR [Department of Natural Resources] orchestrated to prepare and present this story to the stakeholders and tell them what’s going on and explain why they’re seeing changes in the condition of the fish. I think it was also to help prepare the public for the reductions in stocking of salmonid predators that needed to occur to help balance and stabilize the predator-prey ratios in the lake. And eventually down the line—it was several years before there was talk of how to retool the sport fishery, and the charter boat fishing industry, to better take advantage and profit from the existing fishery. Whereas the earlier fishery was Chinook were the king—well, king, obviously—but the mainstay of the fishery—what people came to the lake to fish for. Our agency and myself were not involved in too much of that aspect of things directly, but we were very involved in going to meetings and meeting with the public and stakeholders, and showing how our prey fish data fit into the story and how management decisions were based on these science data.

So yeah, about the meetings and stuff, these were very well coordinated. We had people like Brandon Schroeder [Michigan Sea Grant], Tammy Newcomb [Michigan DNR], folks from the fish commission that were very helpful in piecing the puzzle together. And we actually rehearsed these presentations together so that we had them pieced together. It was multidisciplinary. We had—I think Tom Nalepa was still working at NOAA

[National Oceanic and Atmospheric Administration] with the lower trophic level information, the plankton and benthic invertebrates. which are part of the story in a big way because the decline in animals like *Diporeia* and *Mysis* contributed in some way to that decline in alewife because those were important food items for a lot of the prey fish—in addition to our prey fish piece, and then the DNR and other [US] Fish and Wildlife Service [personnel] that had more of the top predator information. So we pieced all that together into a coherent story and travelled along the Lake Huron shoreline and presented those pieces of information to the stakeholders at meetings that the DNR and Sea Grant organized, but also to fishing clubs like—Thumb Area Steelheaders is a group that I routinely go to and talk to about what's going on in Lake Huron—and some of the other fishing clubs up on—in the Upper Peninsula [of Michigan] and along the coastline.

The biggest challenge I think to that, as any scientist can probably agree to, is taking that detailed scientific data and information and making it consumable and understandable to the public. And I think today that's easier than ever because the public is more educated—the fishing public anyway—seems to be more educated and up on terminology and some of the science behind their favorite fishes. So that was part of the reason we practiced these presentations, I think, was to make sure we weren't just going in and talking like a bunch of PhD's. We wanted to make sure the message was understandable. I think the goal was an eighth-grade level, is what we were kind of taught to do. In doing that, being the new guy on the team, and the new guy in the Lake Huron fishing community, I was nervous. And at a couple meetings I had people like get angry with me about stuff. Unfortunately there was alcohol allowed at some of these meetings and I think that exacerbated some of the emotions of people. But we were there as a team

and we stuck up for each other when we needed to, when somebody would attack us. Credit to our training that we were taught that this could happen at meetings, and how to kind of handle conflict in that situation. So that was a little bit new to me but not unexpected, was the high level of emotion and the anger that I guess some of the stakeholders felt with things. So being part of the team definitely helped alleviate some of the angst and fear, and also resolved the tension in the room by helping to explain things to people that didn't quite get it, or had an opinion and weren't going to change their mind. And we had law enforcement at all these meetings, too. The environmental conservation officers were there. And they actively participated in these discussions by explaining regulations and changes in fishing zones and things like that. So I thought that was very helpful and added like some calming to the meetings.

Before I get off—this out of my mind—I guess the role of social media in all this. I haven't really thought about it a lot other than, just from personal experience. For a while I was trying to get on all the Lake Huron fishing forums, and Facebook's pages and, you know, help explain what was going on, but that's not the case on a lot of those. It's very—some of the people are very opinionated. Angry. Disrespectful. Not polite. So that didn't go very well for me. I'm one of those people that avoid conflict if I can. So like I was telling you earlier [before the interview recording] it's part of the reason I got off Facebook altogether is I just can't handle the—I don't know what the nice word to use is, but—that environment was not conducive to my emotional well-being I guess I will say (both laugh). But I think that's how rumors get spread, I think, about what was—some of the evils of the DNR, and how they're trying to like ruin the fishery by not stocking the predators. And just misuse of science, the way that politics happens, you know, they'll

take a snippet of a statement and use that as like the full story. But on the other hand it was also—I also thought that some of that social media was a useful tool to inform stakeholders about the meetings that were coming up, and also some of them posted videos of the presentations and things. So it was useful in that respect. So I don't know, there's a balance in there on how to use it. And I thought the agencies like Sea Grant made good use of social media and the internet as far as getting the information out there that was accurate and very timely.

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PRICHARD: I'm wondering—well, you brought up two things that I wanted to ask or talk about. I'll start with, What was the source of anger or hostility at these meetings? Did it have to do with what and how many was stocked? And did it have to do with perceptions that people had of having stocked too many? Or unjustified reasons for reducing stocking? Or disbelief in the estimates of abundance of prey?

ROSEMAN: Yeah, a little bit of all of that. I think the biggest thing was that some of the anglers, stakeholders, were upset that their area of the lake was no longer going to receive the tens of thousands of stocked salmonids like they had in the past. And this is more true for Lake Michigan than Lake Huron I think, but it seemed like the more fish you put in, the more the anglers were harvesting out. But there's—it appears from a biological perspective that we kind of reached the threshold and broke that relationship somewhere. So there was anger and disappointment that the numbers of fish weren't getting put in like they used to. I think some people just don't like the government, especially the Michigan DNR, and that definitely came across at some of the meetings. I mean it was

like no matter what you told people or showed them as far as the science data they just didn't want to hear it and didn't believe it. There were fishermen—there still are guys—that are like, Oh, well I fish out here in this area, and there's bait balls out there, and the lake trout and the salmon we catch are spitting alewife up on the boat and this and that, and your surveys are all wrong. So we just were like, Well, here's the data. Here's what we do. There were people that were upset that our bottom trawl survey is a fixed-site survey and we sample the same sites across the lake every year. And we've done it that way since the early 1970s. And their thought was, Well you're not—your data don't reflect what's really going on in the lake. And then we have the newer—and the newer is, like, almost twenty years old now—is the lake-wide acoustic and midwater trawl survey that complements the bottom trawl survey. So we started combining those two datasets together and showing them that we have these two independent surveys and they're telling us the same thing, that the prey fish is in peril, and collapsed, and there are very few alewife left in the lake. And that helped with some of the stakeholders, but there are still a few very vocal people that are still angry and still say, Well, your surveys are wrong. To me that's kind of disappointing that—I guess everybody's entitled to their own opinion—but the facts are in front of us and there's only so many ways you can explain them.

So at one of the fish commission meetings—I forget what year it was, it might have been 2006 or 2007—some of the stakeholders were at the combined lakes meeting in Ypsilanti—I remember it very well. Frank Krist and Ken Merckel, they're—Frank is the chair of the Michigan DNR's Lake Huron [Citizens] Fishery Advisory Committee, and Doc Merckel has been a part of that group, as well. And Merckel is also one of the

Thumb Area Steelheader past presidents, or whatever. But they came up to Jeff Schaeffer [USGS Great Lakes Science Center] and I at one of the meetings and suggested that we take a scientific look at the diets of predators in the lake and see how they—the fish—have responded to the change in the fish community. And we were like, Well, you know, that's a pretty big undertaking. Jim Diana did a similar study, I don't know, a decade or more earlier using fish caught by anglers and pulling the stomachs out of those to see what they ate. And there's a whole bunch of bias and science stuff associated with it. But it is a very economical way to get your hands on a lot of stomachs, *if* your angling community is willing to participate in the study. And at that time—thanks in big part to the Michigan DNR, and Sea Grant, and all the meetings that we did, and the publicity of the story that was happening—you know, the collapse of the prey base and the effect it was having on the fishery, and subsequently the effect that it was having on the local economies that relied on those charter boats and sportfish fishing—we got tremendous buy-in on this project, for—I think we did the first one for three years. I'd have to look up the years. It might have been like 2008 through '10 or something. I can't remember.

PRICHARD: I think it was nine through eleven. I just reread it.

ROSEMAN: There you go. Alright. Thank you (laughs). And we had very little funding support for this. I think the only grant we received was like ten grand from the fish commission or Sea Grant or somebody. But Jeff and I used the resources we had at hand to go out and get these samples. We went to fishing tournaments and we had anglers saving stomachs on trips and just kept them in the freezer. And we gave them zip-lock bags and preprinted tags that they filled out and stuck in with their fish gut. And the fishing groups like the Steelheaders and some of the walleye clubs in Saginaw Bay were

really instrumental in helping coordinate this and get the stomachs into freezers. And then we just travelled around and picked them up when people would call us. And we went to a lot of fishing tournaments and sat in the fish cleaning station and pulled stomachs out of peoples' fish there. But the idea was to see how the predators were responding to the different prey fish community. And I think it was very helpful once we started reporting out on those data that there were some fish that were really thriving in the absence of alewife like Atlantic salmon, steelhead, coho—even though we only saw very few of those. And lake trout were really doing well thanks to round goby being in the system. But the other fish were eating a very broad diet, including a lot of invertebrates like terrestrial insects. Plankton. *Bythotrephes* was showing up in a lot of stomachs, which is another invasive species. And gobies showed up in a lot of fish diets. Particularly the lake trout were doing a lot of feeding on those. And then the walleye diets we looked at mostly came out of Saginaw Bay, but it highlighted a couple of things that we're kind of happy to see. One was the reappearance of mayflies which had kind of been knocked down to very low abundances, if not almost completely extirpated for a time, but they were showing up in the diets, as well as showing up under street lights and stuff like that again like they used to. But I think the management agencies used that diet information kind of to confirm some of the decisions they were making on what fish to stock into Lake Huron. So they reduced Chinook stocking because Chinook diets relied almost exclusively on alewife, and to a slightly lesser extent rainbow smelt. And the few Chinook that showed up in our study still showed that. They weren't feeding on very much else. If alewife were available, they were in their diets. If not, then rainbow smelt. But the other species, like the coho, Atlantics, steelhead, and walleye were eating a very

broad range of food items. And their condition and recruitment seemed to be doing pretty good in spite of the lack of the alewife in the system. So I think that helped confirm with the management agencies like the DNR, and the [US] Fish and Wildlife Service who also plant fish in the lake, that the changes they were making in their prescriptions for stocking were justified by how the fish were responding to the prey base that was available.

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PRICHARD: What do you think the role of the stakeholders' experience or observations is in decision making? If you think about the anglers or the people that live in the coastal communities that—you know they have direct experience with the resource, often at pretty high frequency, but the data—they don't necessarily collect *data*, or are not necessarily able to make a scientific case or basis for their thoughts, but they do have a high number of observations. So what do you think is the role of their experiences? And how do you—how would that be used?

ROSEMAN: Yeah, couple of ways. I think that a lot of their observations in the field while they're out fishing are more, I guess, scientifically reliable these days due to technology and just the spread of information and education that the average stakeholder has. But then converting that into something that's scientifically objective can sometimes be a challenge. Because there's definitely, I guess, bias in the sense that people are going to see what they want to see when they look at nature in certain respects. They have like a predisposition on what they think is going on anyways or, you know, they heard it from their uncle, or grandfather passed down information on stuff like when the—just like

anecdotal things that were handed down to me and that I've actually looked at through time is that walleye eggs hatch when the lilacs bloom. And no matter where I've lived, it's been pretty darn close. So—and I've studied walleye all my career, so, it's just one of those things. I've never put that in a paper yet (both laugh), so, it's coming.

But I think what the Michigan DNR and a lot of other agencies—management agencies—have done now is take the stakeholder bull by the horns and be proactive in getting their stakeholders involved in the science—in the decision making. The fishery advisory committees that the Michigan DNR has is a great example of that. And I—we tried to write a paper about the Lake Huron experience many many years ago—Tammy and Brandon and Jeff and myself—and it's sitting on the backburner in somebody's computer right now. But I think that's a story—just how they pull those groups together and make use of the stakeholders. It's a good example for citizen science to some respect, but also how to effectively manage a fishery based on stakeholder desires and input. And I try to make it to those meetings and share updates from our surveys. They meet a couple times a year for the Lake Huron group.

And I didn't say this up front, but the agency I work for, the USGS, we're a research agency, we're not a management agency, so we don't make decisions about the fishery, or about managing anything. Our role is to do science and research and carry out these long-term surveys, and provide that information to the management agencies with a certain level of interpretation so that the management agencies can use that information to make the informed decisions. It's a fine line, like getting involved with the stakeholders and stuff. Something that people in my agency need to be aware of our role in that we can't voice our personal opinion about a management decision. But we can

say, Well here's what the data show, and here's how the management agency used that information to support their decision making.

Yeah the role of citizen science is like a whole discipline of science in itself these days which is great because there's a lot of valuable information. One of my favorite quotes is that, Fish are good samplers—especially when you're looking at like diets or something. And then take that to another level that fishermen are also good samplers, with the caveat that there's bias there and just other things to be aware of—opinion that people have. Fish I guess don't really have an opinion (laughs), so looking at their diets is more scientifically based than looking at a stakeholder's perspective on things. But it's important to take into consideration. I'm real happy and proud to be involved in the fishery advisory committees and the Sea Grant outreach events that we've been invited to over the years as part of this Lake Huron story.

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PRICHARD: Outside of the meetings—stakeholder meetings—to what extent does your job or your role involve taking or responding to phone calls and emails from stakeholders, and how influential or constructive are they with respect to your thinking and thought process with respect to the Lake Huron fishery?

ROSEMAN: Yeah we don't get—at least I personally don't get a lot of stakeholders—other than people that I already have a relationship with—calling me up and asking about stuff. Usually we get invited to go give a presentation somewhere and that's where we'll interact with random people, or people that I don't know already. And usually it's a pretty good event, relationship. And sometimes leads to more contact later about

following up on a question that somebody had, or providing them with a report. Or more often than anything it's like referring them to a management agency scientist or staff to answer a question about a management issue. So I try not to step out of my role as a researcher as best as I can because we can get into trouble for that—you know, disciplinary at work—by pretending we're a manager when we're not, so—. So that, that's been pretty common. If I can't answer the question or don't feel comfortable answering a question I'll refer them to somebody who I think can. And I'll follow up on it too, and make sure that they get what they're looking for as far as answers and information.

The other aspect is we get asked by the media to do interviews a lot—you know, newspapers, TV, radio. I've done quite a few of those over the years. And it's kind of the same thing. Just remember—for me, remember, Don't swear on the radio (Prichard laughs). And respect our limitations as research scientists, and forward questions, when needed, to the management people.

It's one of the reasons I think we collaborate. On the Lake Huron team—just the level of collaboration on presentations and publications and going to meetings and sharing information, like we share slides about our area of the food web all the time with the DNR and the [US] Fish and Wildlife Service. And vice versa, you know. They send us slides on stuff if we're going to give a talk to an angler group or a college class, or a professional meeting, even. So there's instances where there'll be a dozen or more coauthors on a scholarly product or a presentation at a meeting or something. So that's I think one of the benefits of having something like Michigan Sea Grant and the fish commission and the fishery advisory committee within the DNR. It kind of serves as a

connection point of the different science agencies and disciplines to piece our story together from the different levels of the food web, different parts of the lake, to make a more complete story explaining how things are changing, and what management decisions are based on. And from what I can tell, the stakeholders really appreciate that. There are always people—old people and young people alike—that come up and say, Hey, what's this thing you said? A *Mysis*? What the heck is that thing? How big are those? And, Where do they live? And, I didn't realize that young fish relied on all that stuff down there. So you see that click in somebody's head, and you see it in their eyes, and the expression on their face—that's a really satisfying feeling to know that your message is getting across and that it's making a difference. Because those people are going to talk to their friends, and so on and so forth. It's kind of how the whole system is set up to work, I guess.

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PRICHARD: Do you identify yourself as an angler, and I guess specifically a salmon angler? And if so, how did—or how has that helped you in interacting with those stakeholders that themselves are salmon anglers? And do you think that plays a role in the perception of yourself and your ability to communicate with those stakeholders?

ROSEMAN: Yeah. So I am an angler, as you probably well know. And I definitely use that when I feel it's appropriate to. And also, Chuck Krueger taught us this—I was an undergrad student of his at Cornell a million years ago—and he said that when you go to these meetings don't be afraid to take your wife and kids, and show stakeholders that you're a normal human being, too. And I put pictures of my kid, and my dog, and myself

in my presentations, holding a fish or out in the field doing the fieldwork, or pictures of my garden more often than not these days, now that my kid's grown up and moved away. And my dog, a lot. It's a little bit of, like—take's the, I don't know, the edge off the meeting tone in some ways. And I'm notorious for telling bad jokes and using really dry humor and just watching the audience not get it. But that's more of entertainment for me than anything else. But yeah I think that's important, when it's appropriate, to show that, hey, this fishery matters to me not only from my professional standpoint, but also food on my table, my enjoyment and recreation pleasure, and just knowing that things are alright in the lake. I mean, I can see where somebody at the DNR, a fisheries manager, responsible for Lake Huron, could lay awake at night and worry about what's happening to the fishery, and how that's affecting people that rely on that fishery, from either a charter boat standpoint, or a party store or a bait shop so something like that. The marinas. That definitely—just based on my experience and training—I mean, that's why we have fisheries. People, habitats, and populations. And when one of those three are out of whack, that's where management gets involved more than usual. So in this case we had all three of those. The fish populations were in critical peril. The habitat was being affected by *Dreissena*, which was a big physical habitat driver, as well as other invasive species. And the other component of the habitat that you don't hear as much about is the decline in productivity from like the phosphorus-primary production level. We've pieced that part into the story pretty well in Lake Huron over maybe the last fifteen years using a lot of the EPA [Environmental Protection Agency] data. And that's *really* hard for, I think, average stakeholders to understand, is the role of chemical nutrients and algae in a food web. And then the people part is what you guys are very concerned about here is

how did this affect the people. Sea Grant has done some work looking at economic impacts and some of the social issues along the coastline ports.

I just go back to what Krueger told us. Don't be afraid to be a human. You walk in there with all your credentials and your alphabet soup after your name. What really matters is how you interact with people at these meetings and show that you actually care for them—you're not just a robot up there spitting out numbers and data. But all the science that we do does have some impact on people's lives and livelihoods.

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PRICHARD: In going to the meetings that you go to, or for your piscivore diet study, and interacting with people firsthand at these port towns where the tournaments are taking place when you're collecting stomachs, do you get a sense of the feeling of what was lost there with the crash of the salmon fishery? Or, several years removed from the crash, is there a change in kind of the sentiment in those places or among those people? Is it more or less optimistic now? And is there adaptation to a new fishery, or is there kind of a maintenance of this feeling of wanting to go back or needing to recover from a loss?

ROSEMAN: Yeah, the first few years it was pretty bleak. A lot of the people that could pulled up and moved to Lake Michigan or somewhere else to fish. So you would go to a fishing tournament that maybe in years past had a hundred, two hundred participants, and this time around there would only be a couple dozen. You go to the marina and it would be vacant. A lot of empty slips. And the people that we would talk to at meetings said just that in the early years. Well there's no salmon out there to catch. I can't have clients

come up here and take them out and catch lake trout. They're not going to be happy with that. So they moved to Lake Michigan, or quit the business altogether.

That changed over time in that the people that did stick around and did adapt to the, I guess, fishery that remained, or developed after the alewife and the Chinook declined, seemed to be doing pretty well. They were happy to go out and catch lake trout.

Steelhead were doing really well. Atlantic salmon were doing really well, and I think that's why the Atlantic salmon program kind of ramped up with the state and federal agencies, somewhat based on the diet study that we did that showed that these could survive if not thrive in the current food web. And participation in tournaments definitely has increased. We redid the diet study just a couple years ago with a grad student at Michigan State University and Brian Roth was the advisor on that. What year is it? It's 2021. So I think we did that in 2018 and 2019. The same thing—we got stomachs from anglers, we went to tournaments, and collected angler-caught diets. And there was more participation in tournaments than we saw over a decade ago. And people were happier. They were like, Oh, look at this giant laker. And you were seeing more steelhead and Atlantic salmon. More the—I guess you call them pelagic predators, that ate a wide variety of prey items including the invertebrates, were showing up in the creel. And the walleye fishing has just been amazing. And that's where people are like *really* really happy. The charter industry on Saginaw Bay I think is doing quite well—probably expanded. I don't know what the real numbers are on that since walleye rebounded. If you're not familiar with it, that was a stocked fishery where the DNR would put in walleye fry every spring. And then after the alewife collapse, that predation pressure of alewife eating the baby walleye disappeared and we started seeing natural reproduction of

walleye in the bay. The State [of Michigan] found that they didn't need to stock anymore, and we've just had great walleye fishing in Saginaw Bay for quite a while now. And that's evident if you go up there on a weekend and try to launch a boat, you're going to be waiting a while if you don't get there really really early. It's a very busy, very popular, year-round fishery. There's been quite an ice fishery as well up there for walleye.

But yeah, definitely, you can see it in the marinas, I think there's—early on they were vacant. People just weren't fishing the way they used to. And that was part of, I think, the DNR and the Sea Grant program was to emphasize, Well here are the predators that are still out there. These are the ones that are doing good. The Atlantics. Steelhead. Walleye. The lake trout. Here's how you fish for them. They started like trying to educate people on putting your bottom bouncers down, and your downriggers down to get the lakers, and fish up here for the Atlantics. And different tactics. And that kind of spread through the fishery as well, stakeholder to stakeholder, just showing people how they fished. I think that inline planer board and planer board sales probably jumped quite a bit because a lot of folks use those, myself included, for walleye as well as those pelagic predators. So yeah, it took a while, but there was shift in the fishery, and in the angler behavior and fishing techniques. And I think satisfaction with the fishery has improved somewhat. I think Brandon and the Sea Grant folks measure that with their surveys that we do at the stakeholder meetings every spring. It's not as much as it was when the Chinook were abundant by any means, but it's given some life back to the fishery. Probably not the economic punch that was lost when the Chinook collapsed, but it's something.

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PRICHARD: I'm thinking of myself, or people like me who grew up or got their training kind of after the crash of alewife had happened in Lake Huron, or people that come to Michigan from outside of the Great Lakes. And you can read in the academic literature about this—and I think one of your papers describes an 87% decline in the biomass of prey fish in Lake Huron from the mid-'90s to the mid-2000s—and you get this sense of the awesome, drastic change that happened in the lake and with the ecosystem. But then it's like, given all of the fishing that occurred out of maybe a dozen or so ports for the salmon that were really reliant on alewife and smelt, I just felt like there has to be some social component of the story of what happened in Lake Huron that just isn't available outside of the people that experienced it directly. And I was just wondering if you maybe felt the same way at all, about what exists for—in the literature for someone such as myself. And what—for someone like myself, or that person who wasn't there to experience it directly, what aspects of that social component of the story do you think are important? And then what would you recommend for somebody like that?

ROSEMAN: Boy, I guess from my perspective as a science guy that worked on the fishery, I kind of like felt responsible in some respects. And just being a fisherman and growing up relying on the environment and nature for part of my livelihood, from hunting and fishing and trapping for food and money and recreation. Empathy, I guess. You know, that I understood the magnitude of the loss. And I think we did a really good job of conveying the magnitude of the loss in terms of numbers of fish and biomass. And not having it a direct part of my job role understanding and quantifying or measuring—the social and economic impacts were kind of, in my opinion maybe not very well documented. Although everybody had a realization that it was definitely having a big

impact on local communities, as well as like big level tourism for the sunrise side of the state. I have heard anecdotal stories about land and home sales prices dropping because of the fishery decline. I don't know if that's true or not. And I drive through those towns all the time and just—always go down to the marina. Like every port that I go through. Oscoda. Alpena. Rogers City. The smaller towns, too. Take a walk out on the beach. And how quiet it is there was kind of a weird feeling, compared to previously. Like I'd worked out here in the nineties, early nineties, when the salmon fishery was just going crazy. And how busy the towns were due to the fishing activity. And there'd be people lined along the banks and stuff, and that's pretty rare to see anymore. So yeah, it was definitely—like I felt sad and sorry for what happened, and—it's hard to describe—but a certain level of responsibility for it. Like, you know, I'm one of the science people that's supposed to help manage and take care of this resource and, you know—it's *so weird with this alewife situation* in that some sense it's a huge success for us because that was our goal all the time was—or one of the goals—was to like control these invasive species that have just caused so much trouble for our natives. But on the other hand we've built up a huge artificial ecosystem based on that invasive species using other non-native species to control it. So it was kind of a weird situation in that respect. But more contemporarily it's nice to see things have rebounded somewhat in that the current fishery is pretty viable—self-sustaining in many respects—and that the stakeholders have managed to learn how to make use of that in an economically and, I guess, satisfactorily manner. There seems to be more, in my sense and experience, just more stakeholder satisfaction than there was in 2004-2005 when the big collapse occurred.

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PRICHARD: Is part of the change in stakeholder satisfaction based upon individual people's, like, perception changing? Or are you getting new, I guess, younger generations of stakeholders? Or is it a combination of both?

ROSEMAN: Yeah, I don't know the demographics on that. I assume that's being measured. I think that might be some of the survey questions that Brandon Schroeder asks. I get a feeling, at least from my participation at the fish cleaning stations pulling the stomachs and the tournaments, and my own involvement out there fishing, is there's more younger people participating in the sport, but those people don't seem to show up to the meetings proportionately to their involvement in the fishery. That's a good question—I'd like to see information on that. I know that's been one of the topics for a long time now is the decline in participation in hunting and fishing across the county. But on a local level like up there, I don't know. That'd be interesting to see.

Before this slips my mind you said you kind of came into this profession after the fact on the Lake Huron story. Well you're not too late, as you're probably well aware that—very similar situation in Lake Michigan and Lake Ontario right now. And the science people that have worked on the Lake Huron story are—I wouldn't say are actively involved, but very concerned and somewhat involved in communicating with the science people and the stakeholders as well on those issues. So that's just something to be aware of. It's definitely a concern to everybody that Lake Michigan's charter boat industry is just enormous. And the loss of Chinook over there would be pretty devastating as well. So they're definitely almost making daily adjustments to the science and management over there. A lot of communication between the science staff and agencies, as well as with the stakeholders. The same on Lake Ontario. It's another huge Chinook fishery. Heavily

reliant on Chinook and alewife are a key player in the food webs in both of those lakes, just like they were in Lake Huron.

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PRICHARD: Yeah, I was thinking about lakes Michigan and Ontario and how my perception of how they're managed right now with respect to salmonids is this predator-prey balance paradigm. And I was wondering if you could describe the development of that paradigm, and how related that is to what happened in Lake Huron. And is there any sense, either among the fisheries professionals or the stakeholders, that part of what happened in Lake Huron—well, if the predator-prey balance management paradigm is a viable thing for lakes Michigan and Ontario, is what happened in Lake Huron at all regarded as a failure of the use of that management approach?

ROSEMAN: Um—so part of that question I don't feel comfortable answering. I honestly don't really have an opinion about the success or failure of it. The paradigm I think has been around for a long long time. Decades. You're probably more familiar with the science than most people, but I think it like started in small lakes. And we use the analogy of a dairy farm who has a pasture that's so big and grows so much grass, it can support this many cows. If you put too many cows in there, you're going to have skinny cows. Same thing goes for the lake. The lake has a capacity of supporting x numbers of a certain kind of predator that remain healthy, and when you get above that threshold you get poorer growth, disease, stuff like that. So that's the kind of paradigm that we deal with trying to manage fisheries is keep things in balance. And when you're planting fish you're kind of fortunate in that you can kind of control that to an extent. But when you

suddenly start having wild reproduction occurring of your predators, and a lack of reproduction of your prey, that's when things get kind of messy and harder to control. And I think that's what happened in Lake Huron. We had prey declines and they didn't rebound the way they had historically in the past. And as we did more research and science we learned that we were getting pretty widespread natural reproduction of lake trout. Walleye. There were Chinook salmon that were found to be naturally reproducing in some of the tributaries. So there were things that the management agencies really couldn't control, in addition to the decline in the prey. I mean that's kind of the balancing act that you try to do in a managed lake situation is put in just the right amount of predators for the prey that you think you're going to have. And then there's the whole climate and weather and environmental variables that exacerbate uncertainty.

But yeah I don't feel comfortable answering a management opinion question. I think our management agencies and our scientists in the Lake Huron—and the Great Lakes in particular—are among the best in the world. Classically trained. Highly experienced. We have the best technology. The funding kind of varies from year to year on supporting the science staff and what the work can be done. But given those types of constraints I think we've done a great job as a team. It's not like any one decision or one group of folks is responsible for any aspect of this. This was—the overall scenario here was more of an act of nature, I think, than it was something that somebody decided, and we're suffering from somebody's decision. I don't think that's the case at all.

PRICHARD: Okay.

|01:11:50|

PRICHARD: How similar or different, do you know, is what happened on the Ontario side? Do you know how big the recreational salmon fishery was over there? And was Ontario part of either your diet study, 2009- '10- '11? Or the more recent one through Michigan State [University]?

ROSEMAN: Yeah, so Lake Michigan and Lake Huron diet studies are ongoing right now with Brian Roth and a whole big team. I grew up in New York about an hour away from Lake Ontario in the 1970s and '80s. I fished up there a lot. Especially near the Salmon River. Pulaski. Huge huge salmon fishery. It still is. Just very very busy up there during the open water season. And in the fall when the fish run the rivers it's crazy, with the amount of people.

PRICHARD: Oh I don't mean to interrupt, but I was talking more of the Ontario side of Lake Huron.

ROSEMAN: Oh! Oh! I thought you meant Lake Ontario (laughs). I'm not sure, but I don't think they had the investment in the fishing industry the way Michigan did. As far as like charter industry and stuff like that, I know there was some, but I don't think it's as big as it was in Michigan. We go to Goderich, Ontario every fall as part of our bottom trawl survey and it seems like there's more recreational and sailboats there than there are fishing boats. And also out on the water, not as much, not as many boats when we're out there. They do have a commercial fishery—gillnets and trap nets for a variety of species—that has suffered the consequences of the decline in Chinook. But yeah, as far as like impacts to the port towns, I don't know. My sense is not as big of a deal as it was in Michigan.

PRICHARD: Okay.

[01:14:34]

PRICHARD: Yeah, I guess we can almost wrap things up here. But I—before doing that I wanted to ask, is there anything from your perspective that was really meaningful, or important to you, regarding the salmon and alewife crashes in Lake Huron that we haven't talked about, or that you would like to speak about, maybe reflecting back on it now all these years since it's happened?

ROSEMAN: I think we covered it mostly, but I guess you know in kind of summary just, I value teamwork, and I think what the fishery scientists did as a team effort to convey this story to the stakeholders and also to the scientific community was equally as unprecedented as the change in the fish community, itself—especially our approach to talking to the public and the stakeholders. It was very new to me to get involved so deeply so quickly upon getting hired at the USGS. So I was like really happy and proud to be involved in that, and actually apply some of the stuff that I'd learned. And I took a whole suite of like, I don't know what you call them, but like Dan Brown, Nancy Connelly, Barb Knuth-type classes at Cornell, and I worked in their lab as a student intern for a while. So that whole social aspect of natural resources management and stuff that I'd learned back in the nineties—being able to dredge that up out of my memory and actually apply it in this situation was very satisfying.

And then I think I mentioned this at the beginning, but just the incredible awe of what happened in the lake so quickly and so widespread across the lake was just unheard-of. Like, studying the science literature you see like little changes here and there, and then

maybe a catastrophic event occurs. But nothing like this had been reported. Especially trying to piece it together and explain, Why did alewife collapse? And now more importantly is, Why do they remain at such low levels? And then, How do we make the best with what's left? So that was kind of a challenge, and also a level of satisfaction from, I guess, my job happiness level that, it was never a dull moment. And it still isn't, on the lake.

Yeah I'm really grateful you guys are doing this project, with that little bit of social science background that I have been exposed to. And we try to keep up the data on certain aspects of it through the Sea Grant interaction and the fishery advisory committee approach. I think that's equally as important as going out and measuring how many fish there are out there. So gratitude to your team.

PRICARD: Well thank you. And I've certainly learned a lot. I think it's amazing the amount and quality of research that's been done on Lake Huron, especially including the work that you've done in describing, just the entire food web, and characterizing everything that could be contributing factors with all the invasive species. And it's really amazing that an entire story can be put together about what happened with the whole ecosystem. So I appreciate you just as much, so—.

ROSEMAN: You're welcome.

I'm trying to show you—can you see Blazer? (Ed lifts his laptop so that his webcam shows his dog lying on the floor behind where he's sitting.)

PRICARD: Oh, yeah (both laugh).

ROSEMAN: He's been sleeping through the whole thing here, so—.

PRICHARD: He's a good boy (laughs).

Well I'm going to stop recording now.

end of interview